(12) UK Patent Application (19) GB (11) 2 024 978 A

(21) Application No **7923736**
(22) Date of filing **6 Jul 1979**
(23) Claims filed **6 Jul 1979**
(30) Priority data
(31) **2830073**
(32) **8 Jul 1978**
(33) **Fed. Rep. of Germany (DE)**
(43) Application published **16 Jan 1980**
(51) **INT CL³ F16B 13/06**
(52) Domestic classification **F2H** 16B 16G
(56) Documents cited
GB 1525495
GB 1448753
GB 1405083
GB 1253865
(58) Field of search **F2H**
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(54) Anchoring of Fastening Elements in Holes

(57) A fastening element comprises a fixing plug 1 and an expansible sheath 3 for the plug 1, the sheath 3 being secured to the plug 1 and being radially expandable relative to the axis of the plug 1, the sheath 3 containing a latently expandable material 6. An activating agent is introduced into the material 6 either before or after insertion of the plug into the hole, either by dipping or injecting of the plug, to effect expansion of the material. The expandable material is a foamable plastics in semi-liquid or paste or powder or granular form, and the activating agent is a liquid. The sheath 3 comprises a woven material such that axial expansion is prevented.

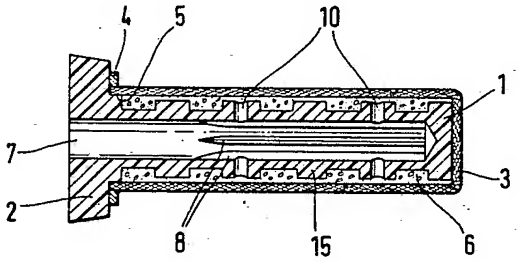
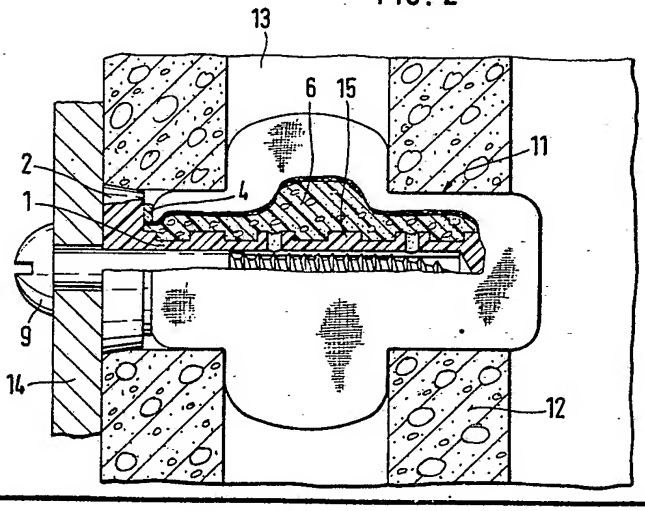


FIG. 1

FIG. 2



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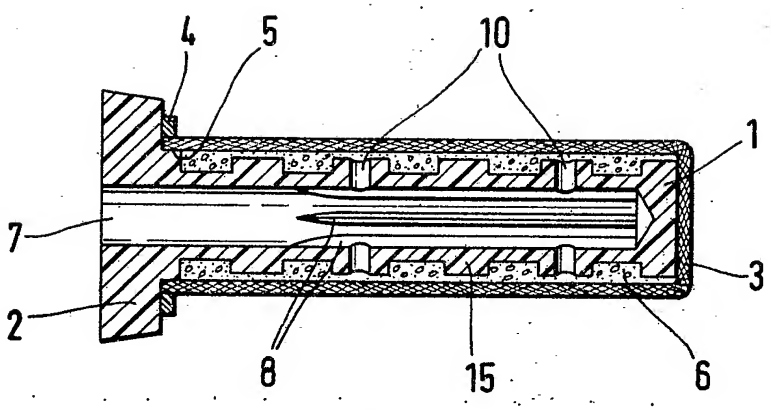
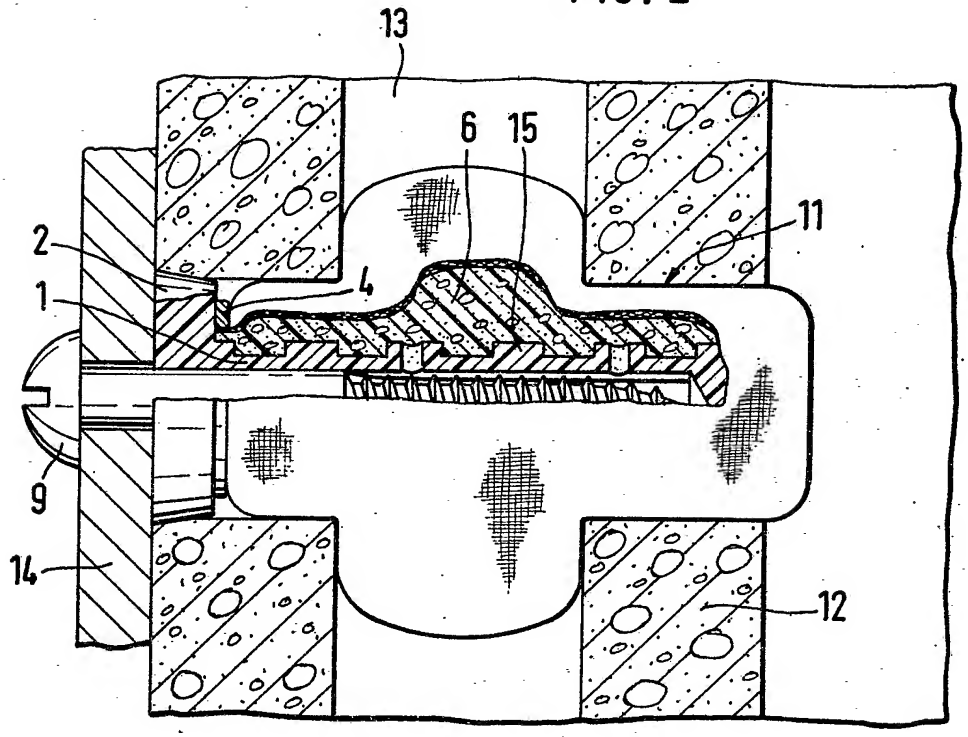


FIG. 1

FIG. 2



SPECIFICATION

Improvements in or Relating to Fastening Equipment and to a Method of Anchoring a Fastening Element

This invention relates to a method of anchoring a fastening element in a hole drilled in masonry or similar material by means of an expanding agent such as, for example, foamable plastics material.

It is already known from DE-AS 24 11 145 to inject a foamable plastics material as expanding agent into a fixing plug casing that has been inserted into a drilled hole. The plastics material, which foams in the fixing plug casing and is prevented from escaping from the injection opening by a stopper closing the opening, forces the fixing plug casing outwards until it lies against the wall of the drilled hole. A prerequisite of this method of anchoring is that the plastics material is mixed with an activating agent before being introduced into the plug casing. This mixing and the subsequent introduction into the plug casing require a certain amount of skill on the part of the user, who must take particular care that it is necessary to carry out the work quickly, as foaming begins immediately after mixing.

The object of the invention is, therefore, to improve and considerably simplify anchoring where expanding agents, such as foamable plastics materials, are used.

In accordance with the invention, this is achieved in that the expanding agent surrounds the fastening element and is held in the fastening element by a sheath that is expandable in a radial direction, wherein the expanding process may be initiated by an activating agent which is introduced into the fastening element before it is inserted into the drilled hole.

The construction according to the invention produces an anchorage in a most simple manner, by further providing the fastening element constructed according to the invention with the activating agent, so that it can then immediately be pushed into the prepared drilled hole. From this point on, the anchorage is completed without the user taking any further steps, so that the orderliness and the reliability of the anchorage are no longer dependent on the skill of the user. The sheath prevents the unlimited expansion of the expanding agent where anchoring must be carried out in walls having hollow spaces and the like. For example, in the case of cavity bricks, if there were no sheath, the expanding agent could expand without restriction in the region of the cavities, thus preventing an efficient anchorage. The sheath holds in the expanding agent, however, so that a compact bulging structure is produced which engages behind the wall over a large surface area in the area of the drilled hole that accommodates the fastening element. If there should be too much expanding agent in relation to the size of the drilled hole or the hollow space, then the expanding agent can escape to the outside between the fastening element and the wall of the drilled hole. Special openings such as notches or bores can also be provided in the region of the sealing flange of the fastening element.

In a development of the invention, the sheath can consist of a preferably anisotropic woven fabric and the activating agent can be introduced, when it is liquid in form, by immersing the fastening element in the activating agent. With this construction the user has nothing to do but to dip the fastening element according to the invention in an activating agent and insert it into the prepared drilled hole. The woven fabric sheath allows the activating agent to pass through to the expanding agent. The anisotropic construction of the sheath restricts its expansion only in an axial direction. The expansion is concentrated on spreading out in the radial direction by appropriately orientating the anisotropic fabric so that it has greater elasticity in the radial direction.

In accordance with another design of the invention, however, it is also possible to supply the activating agent to the expanding agent by means of a longitudinal bore and a transverse bore in the fastening element, the transverse bore being located in the region of the expanding agent. This introduction can be achieved by injection by means of a syringe, the nozzle of which is inserted into the bore of the fastening element. This bore serves later to accommodate a fastening screw.

In accordance with further features of the invention, the expanding agent can be used in a liquid, preferably semi-liquid, state or it can be pressed from a pulverulent material. With a liquid expanding agent it is possible to inject the activating agent, while with an expanding agent pressed from a pulverulent material, immersion of the fastening element in the activating agent is advantageous.

The present invention also provides fastening equipment comprising a fixing plug and an expansible sheath for the plug, the sheath being secured to the plug and being radially expandable relative to the axis of the plug, the sheath containing a latently expandable material.

The present invention further provides a method of anchoring a fixing plug in a hole, the plug being part of equipment according to the invention, wherein the method comprises introducing an activating agent into the material in the sheath to effect expansion of that material, and inserting the plug and sheath into the hole.

Fastening equipment constructed in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawing, wherein:—

Fig. 1 is a longitudinal section of the fastening equipment, and

Fig. 2 is a longitudinal cross-section through the fastening equipment when anchored in a cavity brick wall.

Referring to the accompanying drawing, the fastening equipment comprises a fixing plug 1 having a longitudinal bore 7 (which is closed at the leading end of the plug) communicating with

the exterior of the plug by means of transverse bores 10. The non-leading end of the plug is provided with a flange 2 to limit the depth to which the plug can be inserted into a hole and also to seal off the mouth of the hole.

The longitudinal bore 7 has a number of longitudinally extending ribs 8 for receiving a fastening screw, for example a wood screw 9 (see Fig. 2).

The exterior surface of the plug is formed with a number of annular ribs 15 which increase the resistance to withdrawal of the plug from a hole into which it has been anchored.

A flexible sheath 3 is placed round the plug 1 prior to the insertion of a plug into a hole. The sheath 3 is held on the plug 1 by a spring ring 4 which grips the open end portion of the sheath and holds it against a collar 5 of the plug.

A latently expandable material 6 is contained in the space between the exterior surface of the plug and the sheath. The material 6 may be in the form of a paste or semi-liquid, or it may be in the form of a powder or granular material. It is preferred if the latently expandable material 6 is a foamable plastics.

The sheath 3 is made of a flexible anisotropic fabric which can expand and/or stretch only in a radial direction relative to the axis of the plug 1. Such a fabric may, for example, be constituted by a woven material in which a respective one of the warp or weft is woven more tightly than the other.

As will be seen from Fig. 2, when the fixing plug 1 and sheath 3 have been inserted into a bore 11 formed in a facing wall and another wall (which may be an intermediate wall or another facing wall) of a cavity brick 12 having a cavity 13 between those walls and the material 6 is caused to expand (as explained below), the sheath and the material 6 forms a symmetrical counter-abutment area behind the facing wall of the brick and between that wall and the other wall of the brick.

Because of the anisotropic nature of the sheath 3, expansion of it is prevented in a direction along the axis of the plug. Consequently, any expansion of the material 6 and the sheath 3 is usefully employed to form the abutment area.

As soon as expansion of the material 6 and the sheath 3 is complete, a component 14, for example a facing panel, can be secured to the brick 12 by means of the fastening screw 9.

Expansion of the material 6 can be achieved as follows. If, as described above, the sheath 3 is porous, then the sheath can, immediately prior to being inserted in a hole, be dipped into liquid activating agent. The latter permeates through the sheath 3 and effects expansion of the material 6.

Alternatively, liquid activating agent can be brought into contact with the material 6 by injecting it through the longitudinal bore 8 and out through the transverse bore 10. In this case the activating agent can be introduced either before or after the plug and sheath have been introduced into the hole.

The expanded material in the sheath, that is to say the material formed by interaction of the latently expandable substance and the activating agent, may be a foam plastics material, for example a polyurethane foam, a polystyrene foam or a PVC foam.

Claims

1. Fastening equipment comprising a fixing plug and an expansible sheath for the plug, the sheath being secured to the plug and being radially expandable relative to the axis of the plug, the sheath containing a latently expandable material.

2. Fastening equipment as claimed in claim 1, in which the latently expandable material is in the form of a powder.

3. Fastening equipment as claimed in claim 1, in which the latently expandable material is granular in form.

4. Fastening equipment as claimed in claim 1, in which the latently expandable material is in the form of a paste.

5. Fastening equipment as claimed in any one of claims 1 to 4, in which the material is a foamable plastics.

6. Fastening equipment as claimed in any one of claims 1 to 5, in which the sheath is made of a fabric.

7. Fastening equipment as claimed in any of claims 1 to 6, in which the sheath is made of a woven material.

8. Fastening equipment as claimed in any one of claims 1 to 7, in which the sheath is made of an anisotropic material so that expansion of it in a direction along the axis of the plug is restricted.

9. Fastening equipment as claimed in any one of claims 1 to 8, in which the fixing plug comprises a longitudinal bore and at least one transverse bore which connects the longitudinal bore to the outside of the plug.

10. Fastening equipment substantially as hereinbefore described with reference to and as illustrated by the accompanying drawing.

11. A method of anchoring a fixing plug in a hole, the plug being part of equipment as claimed in any one of claims 1 to 10, wherein the method comprises introducing an activating agent into the material in the sheath to effect expansion of that material, and inserting the plug and sheath into the hole.

12. A method as claimed in claim 11, in which the activating agent is introduced prior to insertion of the plug and sheath into the hole.

13. A method as claimed in claim 12, in which the activating agent is a liquid and is introduced into the latently expandable material by dipping the sheath into the activating agent.

14. A method as claimed in claim 11 or claim 12, in which the activating agent is a liquid and is introduced into the latently expandable material through the said longitudinal and transverse bores.

15. A method of anchoring a fixing plug in a hole, substantially as hereinbefore described with

reference to and as illustrated by the accompanying drawing.

16. Method of anchoring a fastening element in a hole drilled in masonry or similar material by means of an expanding agent such as, for example, foamable plastics material, characterised in that the expanding agent surrounds the fastening element and is held on this by means of a sheath that is expandable in a radial direction, wherein the expansion process is initiated by means of an activating agent introduced into the fastening element before it is inserted into the drilled hole.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

PUB-NO: GB002024978A

DOCUMENT-IDENTIFIER: GB 2024978 A

TITLE: Anchoring of Fastening Elements in Holes

PUBN-DATE: January 16, 1980

ASSIGNEE-INFORMATION:

NAME	COUNTRY
FISCHER ARTUR	N/A

APPL-NO: GB07923736

APPL-DATE: July 6, 1979

PRIORITY-DATA: DE02830073A (July 8, 1978)

INT-CL (IPC): F16B013/06

EUR-CL (EPC): F16B013/14

US-CL-CURRENT: 411/82

ABSTRACT:

CHG DATE=19990617 STATUS=O> A fastening element comprises a fixing plug 1 and an expansible sheath 3 for the plug 1, the sheath 3 being secured to the plug 1 and being radially expandable relative to the axis of the plug 1, the sheath 3 containing a latently expandable material 6. An activating agent is introduced into the material 6 either before or after insertion of the plug into the

hole, either by dipping or injecting of the plug, to effect expansion of the material. The expandable material is a foamable plastics in semi-liquid or paste or powder or granular form, and the activating agent is a liquid. The sheath 3 comprises a woven material such that axial expansion is prevented. □